

NANOMATERIALS FOR LIGHT

Workshop within the framework of the European project RADIANT
(FEBRUARY 26, 2025)

Venue: Institut de Ciència de Materials de Barcelona (ICMAB-CSIC)

Carrer dels Til·lers s/n, Campus de la UAB. 08193 Bellaterra (Spain)

26th February 2025

TIME	DESCRIPTION
10:00 – 10:15	Welcome by ICMAB Director (Prof. David B. Amabilino)
10:15 – 11:00	Invited talk: Prof. Dmitry Baranov (Lund University) <i>Collective Phenomena in Self-Assembled Perovskite Nanocrystals</i>
11:00 – 11:45	Invited talk: Dr. M. Isabel Alonso (ICMAB) <i>Optical characterization of materials by spectroscopic ellipsometry</i>
11:45 – 12:15	Lab Visits
12:15 – 13:30	<i>Lunch</i>
13:30 – 14:15	Invited talk: Prof. Iván Mora-Seró (UJI) <i>Halide Perovskite for LED applications</i>
14:15 – 15:00	Invited talk: Prof. Lakshminarayana Polavarapu (UVigo) <i>Polarized absorption and emission from metal halide perovskites and their derivatives</i>
15:00 – 15:45	Invited talk: Prof. Francesco Di Stasio (IIT) <i>Colloidal quantum dots for near-infrared optoelectronics</i>
15:45 – 15:50	Closing by Dr. Agustín Mihi (ICMAB)

Collective Phenomena in Self-Assembled Perovskite Nanocrystals

Dmitry Baranov

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Abstract: This presentation explores the structure-property relationships in perovskite nanocrystal superlattices. These materials provide an exciting platform to study cooperative X-ray diffraction, the dynamics of colloidal self-assembly, and early evidence of collective optical behaviour.



Short Biography: Dmitry Baranov is a tenure-track Biträdande Universitetslektor (Assistant Professor) at Lund University's Division of Chemical Physics. He earned his B.Sc. in Chemistry from Mendelev University of Chemical Technology of Russia in 2008 and gained early research experience at the Kurnakov Institute, working on magnetic nanoparticles and polymer composites. Influenced by Prof. Sergey Gubin's perspective on nanocrystals as inorganic macromolecules, he later expanded his expertise through research stays in the US and Germany, focusing on magnetic nanoparticles and gold colloid surface chemistry. His work bridges nanochemistry, materials science, and international collaboration.

Optical characterization of materials by spectroscopic ellipsometry

M. Isabel Alonso

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Abstract: Ellipsometric spectra can be related to both structural and optical parameters of the samples. This talk will introduce ellipsometry and show its application using various examples of materials relevant to devices, such as hybrid lead halide perovskites.



Short Biography: M. Isabel Alonso is a materials physicist with expertise in solid-state physics, nanoscience, and technology. Research focuses on expanding semiconductor device functionalities for optoelectronic, energy, and sensing applications. Beyond silicon, work includes Si-based nanomaterials, particularly SiGe structures grown by molecular beam epitaxy (MBE), as well as organic and hybrid semiconductors. Specialized in optical spectroscopy techniques, including spectroscopic ellipsometry, Raman scattering, and photoluminescence, to study optical, electronic, and vibrational properties.

Halide Perovskite for LED applications

Iván Mora Seró

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Abstract: The great success of halide perovskites solar cells boosted also the interest on other optoelectronic applications as in Light Emitting Diodes (LEDs). Halide perovskite LEDs provide narrow electroluminescence (EL) peak, purer colors, and versatility to tune the emitting color. In this talk, I discuss different strategies to increase the performance, considering both the external quantum efficiency (EQE) and stability, but also the reproducibility.



Short Biography: Iván Mora Seró is a researcher at Universitat Jaume I (UJI), Spain, leading the Advanced Semiconductors Group. His work focuses on nanostructured devices, quantum dot and perovskite solar cells, and light-emitting devices. He has published 120+ papers, led six research projects, and given 22 invited talks. He collaborates internationally and serves as a reviewer for top journals and funding agencies. He has received multiple research and teaching recognitions.

Polarized absorption and emission from metal halide perovskites and their derivatives

Lakshminarayana Polavarapu

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Abstract: Over the last decade, metal halide perovskite nanocrystals (LHP NCs) and their derivatives have emerged as extremely efficient light sources with color-tunable capability by simple chemistry. The high luminescence efficiency and color-tunability make them promising materials for polarized emission. In my talk, I will present our group's work on achieving polarized emission and absorption in metal halides and their derivatives through the self-assembly of nanocrystals or helical structural engineering..



Short Biography: Dr. Polavarapu leads the Materials Chemistry and Physics Group (MCPG) at CINBIO. He earned his PhD in Physical Chemistry from the National University of Singapore in 2011 and held postdoctoral positions in Spain and Germany, including as an Alexander von Humboldt Fellow at LMU Munich. With 90 publications, an h-index of 56, and 12,000 citations, he serves on editorial boards for Nanoscale, Nanoscale Advances, Advanced Physics Research, and Scientific Reports. His research focuses on shape-controlled synthesis and self-assembly of nanocrystals for applications in sensors, LEDs, photovoltaics, and photocatalysis.

Colloidal quantum dots for near-infrared optoelectronics

Francesco Di Stasio

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Abstract: Near-infrared (NIR) light-sources are of interest for a variety of applications such as hyperspectral imaging, night vision, telecommunication systems and point-of-care testing. Colloidal quantum dots (QDs) possess interesting properties for NIR optoelectronics thanks to their tunable photoluminescence, solution processability (which also enables mechanically flexible devices), and capability for CMOS integration. Here, I will discuss some recent findings on different NIR-emitting QDs, such as InAs or Hg-based ones.



Short Biography: Francesco Di Stasio graduated in Materials Science at the University of Genoa in 2008, then he pursued a Ph.D. in Physics at University College London until 2011. Following the Ph.D., he worked as a research scientist at Cambridge Display Technology until he relocated to Istituto Italiano di Tecnologia (IIT) in 2013 for postdoctoral research. In 2016 he was awarded a Marie Skłodowska-Curie Individual Fellowship at ICFO and since 2020 he is Principal Investigator of the Photonic Nanomaterials group at IIT after being awarded an ERC Starting grant. His research focuses on the development of light-sources based on colloidal semiconductor nanocrystals.